

Factors Influencing the Post-Stocking Movement of Hatchery Trout in Streams

By PFBC Staff

The Pennsylvania Fish & Boat Commission stocks more than 2 million hatchery trout annually in waterways throughout Pennsylvania before the start of the trout season. These trout provide some great recreation for anglers in the spring and early summer. Many anglers will have good success in most waterways, particularly on opening day. But some anglers, like those from the northeastern part of the state, have reported poor luck in the past few years. We've heard many explanations, including poaching, poor weather, poor fishing technique and moon phases. Most anglers believed that the trout were just not there anymore.

The Commission had suspicions that these anglers could be right. We decided to look at the problem by investigating a stream in which anglers reported poor success. In 2003, fish were stocked into the East and West branches of Dyberry Creek, Wayne County. Our fisheries biologists then went back and used electrofishing gear two days later to capture the trout. Indeed, the trout were not there! These results along with waterways conservation officer observations and angler complaints about other streams suggested that this problem could be widespread in northeastern Pennsylvania.

Where did the trout go and why did they leave? Some blamed high spring flows, but studies show that trout stay put during floods. They take up positions behind boulders, logs and eddies away from strong currents. Others blamed our hatcheries. It is true that the freestone streams in northeast Pennsylvania are stocked with trout raised in limestone facilities from the central part of the state. Could it be possible that trout raised in a fertile limestone facility would want to seek those conditions when stocked into a freestone stream environment? We found this not to be the case. The Dyberry Creek electrofishing study included fish that were stocked from limestone and freestone hatcheries. The fish that remained after the stocking were evenly split between the two sources. Another Commission study showed that limestone-raised fish actually outperformed freestone-raised fish when placed into an acidic freestone stream. The hatchery water source did not appear to be the problem in this case.

Water temperature could be a factor. Some studies have shown that hatchery trout move downstream

when stocked into water colder than 10°C (50°F). Water temperature is usually below 50°F in many of the streams we stock in northeastern Pennsylvania during the preseason. Cold water could be the problem, but it doesn't explain why we were successful with trout stockings in past years.

Temperature acclimation could be a piece of the puzzle. Scientific studies have shown that trout will adjust their metabolism based on the temperature they routinely experience. Trout accustomed to cold water will perform better than those accustomed to warm water when suddenly exposed to very cold temperatures in the laboratory. The trout acclimated to cold water will have lower activity rates and lower mortality.

In the spring of 2005, fisheries biologists decided to test the effects of temperature acclimation on stocked trout movement. We wanted to find out where trout go and if trout acclimated to colder water temperatures show less movement out of stocked areas than trout acclimated to warmer water temperatures. The study took place on Wysox Creek in Bradford County and Tunkhannock Creek in Susquehanna County. Hatchery trout movement was measured using several techniques, including tagging, radio telemetry, electrofishing and a creel survey.

Over 4,000 hatchery trout were anesthetized and then tagged before they were stocked into either stream during the preseason. The tags consisted of a piece of colored laminated plastic. They were attached to the trout just below the dorsal fin. Tagging mortality was minimal. Each tag had a small unique identification code and a telephone number. The public was then informed about the project. Anglers were asked to call the telephone number if they caught any tagged trout. Information was collected, including the species of trout caught (brook, brown, rainbow or golden rainbow), date of catch, stream where caught, tag color, tag number and whether the fish was kept or released. The color of each tag told us which stream the trout was stocked in and whether it was acclimated to cold or warm water temperatures. The tag number told us the species of the trout that was stocked.



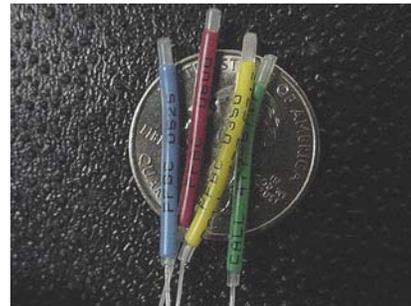
The trout came from one of two Commission hatcheries, Benner Spring (control fish), Centre County, and Oswayo (treatment fish), Potter County. The mean water temperature was 9.9°C (50°F) for Benner Spring and 7.65°C (46°F) for Oswayo. This might seem like a small difference in temperature, but laboratory studies have shown that a few degrees are enough to alter fish behavior. The stocking temperatures in both streams were significantly lower than the water temperatures from both hatcheries. Fish were stocked in Wysox Creek on March 7th, which had a water temperature of 1.7°C (35.1°F). Tunkhannock Creek had a water temperature of 0.3°C (32.5°F) on March 8th when the fish were stocked there.



Twenty five trout were also surgically implanted with a small radio transmitter. The trout came from either Benner Spring hatchery (control) or Oswayo hatchery (treatment). Two fish of each species (one from Benner Spring and one from Oswayo) were then released at each stocking point on Wysox Creek and Tunkhannock Creek. Wysox Creek received four rainbow, four brown and four brook trout. Tunkhannock Creek received five rainbow, four brown and four brook trout. The signal from the transmitters was then tracked using a receiver.



In the spring of 2005, fisheries biologists monitored the movement of the radio-tagged preseason stocked trout in both streams with radio telemetry equipment. The radio-tagged fish showed little movement for the first few days of the study. Most of the rainbow trout from both creeks left their stocking points and headed downstream after the third day. Several rainbows were never found again. One rainbow trout from Tunkhannock Creek was found nearly 13 miles downstream from its stocking point. And one rainbow from Wysox Creek was found 123 miles downstream in the North Branch of the Susquehanna River.



Brown trout movement varied more. Most brown trout stayed at their stocking points for at least seven days. When they did move, they usually didn't travel that far. The longest traveler was a brown trout that moved 6 miles. Only one brown trout found its way to the Susquehanna River. And one brown trout moved slightly less than a mile upstream.

Brook trout stayed at their stocking points for the longest time. Almost all the brookies remained in place for a minimum of 10 days. The exception was a Tunkhannock Creek brookie that began moving after a week. Brook trout movement ranged between 0.5-mile and 11.6 miles with the greatest movement occurring in Tunkhannock Creek. One Tunkhannock brookie moved about 7.5 miles downstream before ascending another creek. It was the only time during this study that a trout entered a tributary stream.

By the end of the preseason period, three of the 12 radio-tagged trout (two browns and a brook) remained in the stocking limits of Wysox Creek and three of the 13 radio-tagged trout (two browns and a rainbow) remained in the stocking limits of Tunkhannock Creek.

Statistical analysis of the radio-tagged trout showed that initial movement away from a stocking point was associated with species instead of hatchery. Rainbow trout left first (three days), followed by brown trout (seven days) and then brook trout (10 days). This movement pattern seemed to coincide

with visual observation of large groups of trout disappearing from stocking points after seven to 10 days. It was predicted that control trout (Benner Spring) would choose warmer water temperatures than the treatment trout (Oswayo), but this did not happen. In one case, a rainbow acclimated to the cold Oswayo hatchery water actually chose warmer temperatures than the other trout acclimated to the warmer Benner Spring hatchery water. Tracking demonstrated that there was no immediate downstream movement in response to cold stocking temperatures.

Only six tags out of over 4,000 tagged trout were returned during the tagging part of this study (a 0.001% return rate). A formal creel survey at Wysox Creek recorded only three trout caught from a pre-season stocking of 2,000 trout. The number of trout present in the streams during the electrofishing study and the number of angler tag returns (0.001%) were too low to permit statistical analysis on the performance of cold acclimated trout. Nevertheless, it was still apparent that most of the hatchery trout either perished or left the stream section after they were stocked.

The results of this study suggest that temperature acclimation was not a factor in hatchery trout movement. Control and treatment trout did not exhibit immediate downstream movement in response to cold stocking temperatures, although they eventually did move downstream. The control and treatment trout did not choose different temperatures. Finally, the treatment trout were not expected to move because they were acclimated to colder water temperatures. This was not the case because they moved just as often as did the control trout, which were acclimated to warmer water temperatures.

It is apparent that other factors or a combination of factors could be involved in movement of hatchery trout. Two factors that might come to mind are water chemistry and high flows. Water chemistry and flooding did not cause trout movement in this particular study. The worst pH we found during the entire pre-season period was 6.8 following heavy rains and snowmelt. The radio-tagged trout also did not move during the two floods we experienced in the spring of 2005.

This study did not help us discover the cause of the trout movement problem, but it did give biologists some ideas on how to prevent it. In 2006, we stocked streams in northeastern Pennsylvania as close to opening day as possible, particularly problem waterways like Wysox and Tunkhannock creeks. We also changed the species composition of trout that were stocked during the pre-season. Many streams in the



Northeast did not receive rainbow trout during pre-season stockings.

In 2006, we also decided to take a more extensive look at the trout movement problem. Biologists from across the state completed electrofishing studies on as many pre-season stocked streams as possible. Electro-fishing took place between 10 and 20 days after stocking and before opening day. Biologists shocked at two direct stocking points on each stream and estimated the percentage of trout that remained at the location. We measured as many variables as possible and correlated them to hatchery trout residency. The variables we considered were associated with the hatchery environment, the trout, the stocking process and the stream environment.

We considered more than 20 different variables, but none showed a strong correlation with trout residency (the number of trout remaining at a stocking point). There was a trend for better trout residency in waters with better physical habitat such as undercut banks, log jams and boulders. Some other factors that influenced residency were stream pH, bank stability, bank vegetation, stream width, stream velocity and stream depth. But all of these factors do not statistically explain why trout were not staying at their stocking points.

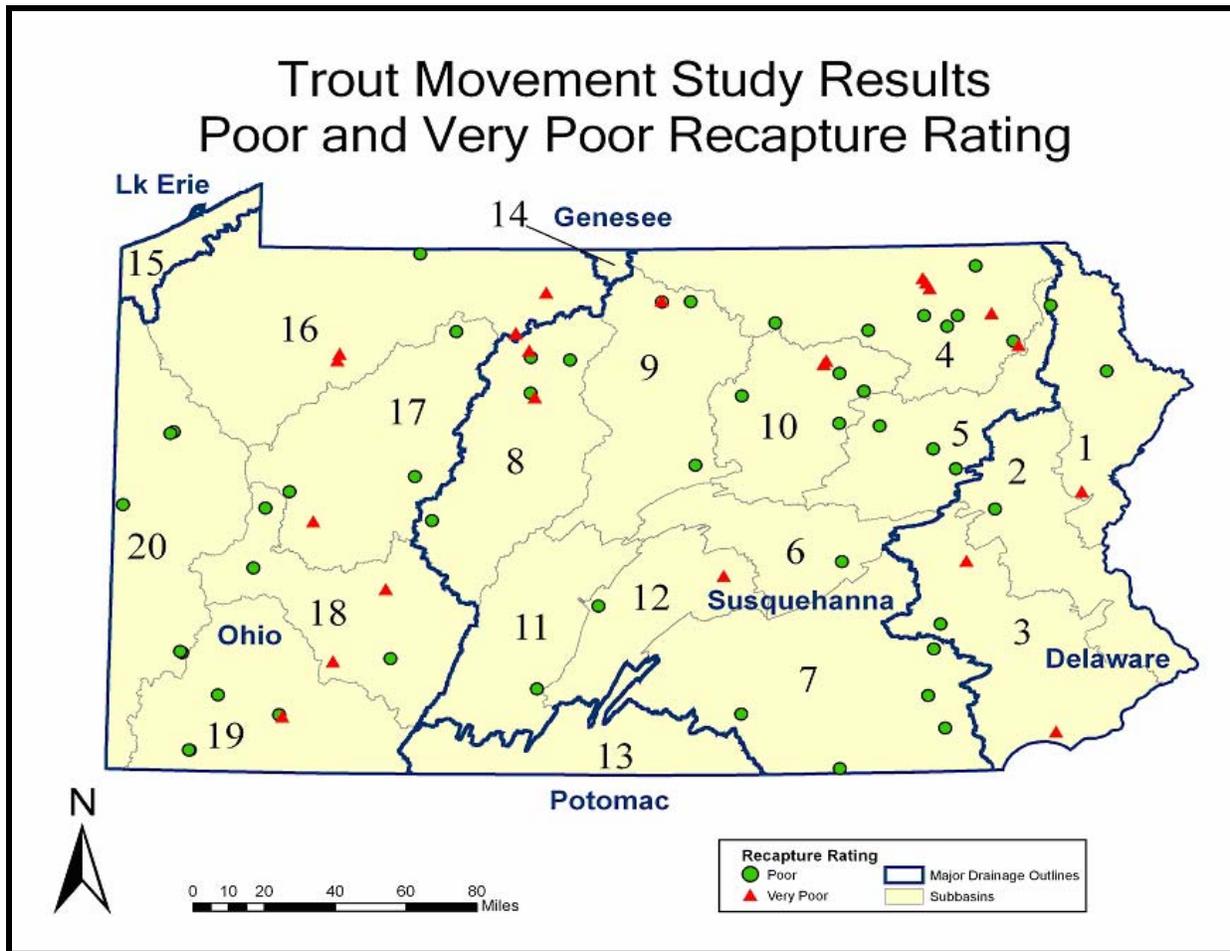
We did learn that the problem of trout movement was not just limited to the northeast. Streams with poor trout residency existed statewide. However, there were concentrations of streams with poor residency in the northeast and northcentral portions of the state. Acidic water chemistry may have explained some of the movement problems in the northcentral part of the state. The full report is available at the Commission's website, http://sites.state.pa.us/PA_Exec/Fish_Boat/afm.htm

All of these studies have not really explained why trout leave their stocking points. We know they are



leaving, but we just don't know why yet. Research on the problem will continue in 2007.

In the meantime, we are addressing the problem in several different ways. As mentioned above, some streams will not receive rainbow trout in their preseason allocation. We are also trying to stock as many streams as close to opening day as possible. Part of this effort includes the new regional opening day concept that has been implemented in 2007. Select counties in southcentral and southeastern Pennsylvania will now have an opening day two weeks earlier than the rest of the state, March 31 in 2007. Other areas of the state will remain the same with the mid-April trout opener.



References

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